



WIRELESS COMMUNICATIONS ASSOCIATION

Out of Band Emissions Larger Channel Bandwidths

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Device challenges to meet current requirements

- Channels sizes of greater than 5 MHz were never envisioned during the BRS/EBS rulemaking in 2004.
- While base station emissions mask requirements can be met by using hardware filtering solutions for 20+ MHz channels, these solutions do not apply to mobile devices such as handsets.
- Today's WiMAX devices using 10 MHz channels have difficulty meeting the current limits.
- Next wave of 4G WiMAX (16m) and LTE devices will be focused on 20 MHz channels and highly mobile form factors (handsets/smartphones/MIDS). Without the proposed rule change, the only option is to unnecessarily reduce device bandwidth or power, limiting benefits of the 4G technology.
 - › The device would have artificially low battery life and could not dissipate the extra heat that would be generated
 - › There would be up to 35% coverage loss and 20% capacity loss on the uplink.

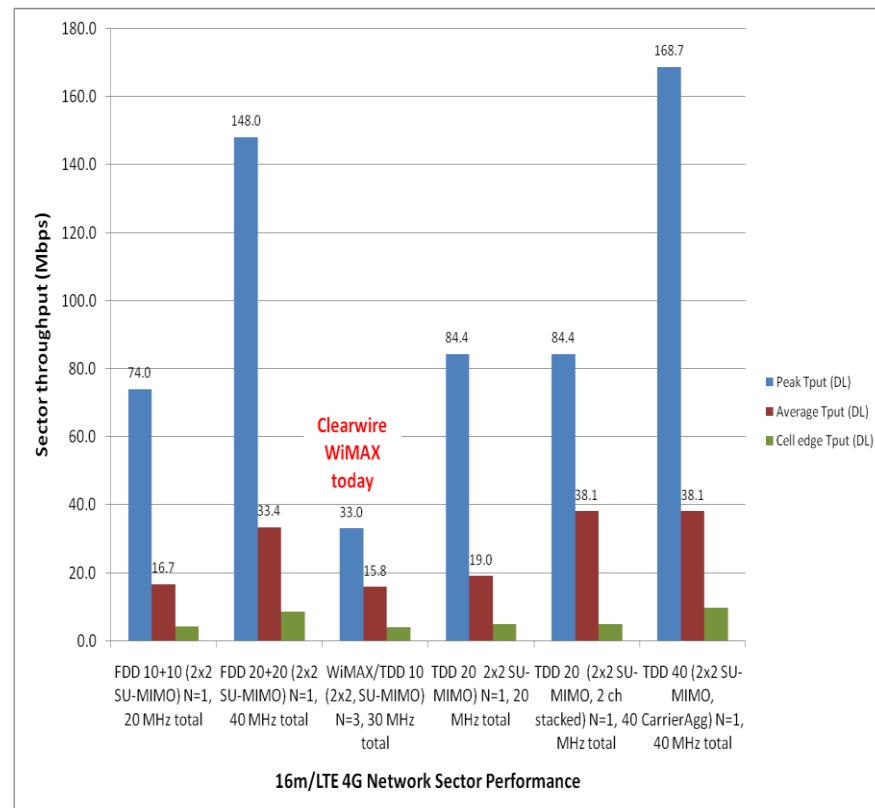
Clearwire: An example of current and future system dimensioning

■ Clearwire using current WiMAX technology

- 10 MHz channel bandwidth
- 30-60 MHz required for a given market, including sector/channel augments for unanticipated capacity growth
- Typical subscriber downlink throughputs from 3-6 Mbps. Maximum user performance on unloaded network of 33 Mbps.
- Average sector throughput of 12-15 Mbps
- Typical monthly tonnage per subscriber of 7 GB

■ Clearwire using wider bandwidth technology

- Following Shannon's law, as channel bandwidth is increased, channel throughput increase linearly. Increasing CINR through frequency reuse gives only a logarithmic increase in capacity.
- 20 MHz+ channel bandwidths are a fundamental requirement and building block of 4G technologies
- 20-40 MHz required for a given market for 1 to 2 carriers per sector
- Non adjacent carrier aggregation
- Typical subscriber downlink throughputs from 6+ Mbps. Maximum user performance on unloaded network of up to 168 Mbps.
- Average loaded sector throughput of 25+ Mbps



Proposed approach

- The current FCC mask for BRS/EBS should consider the use of wider channels
- Propose that we align with current 3GPP methodology for mobile devices
- Change **Part 27.53(m)(4) and (6)** rules to read:

(4) For mobile digital stations, the attenuation factor shall be not less than ~~40~~⁴³ + 10 log (P) dB at the channel edge, 43 + 10 log (P) dB beyond 5MHz from the channel edges and 55 + 10 log (P) dB at ~~X~~^{5.5} MHz from the channel edges where X is the greater of 6MHz and the emissions bandwidth as defined in (6). Mobile Service Satellite licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed or two percent for the case of mobile digital stations. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified, or 1MHz or 2 percent for the case of mobile digital stations). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.